Standards Review Commission

Overview of the Standards for Mathematics

NC Department of Public Instruction
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Overview

- Standards are organized by grade level K-8

- By course in High School – Math I, Math II and Math III

- Fourth level courses such as Pre-Calculus, Advanced Functions and Modeling and Discrete Math – 2003 Standards

- Not under review at this time

- Will be addressed once revisions to K-math III are complete

Process

- Outline the organization of standards

- Walk through each grade level and course

- Copies of standards

- Unpacking documents available

Standards

Domain

Grade Level

Operations and Algebraic Thinking — 1.OA

Represent and solve problems involving addition and subtraction.

1. Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.[2]

2. Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

Understand and apply properties of operations and the relationship between addition and subtraction.

3. Apply properties of operations as strategies to add and subtract.[3] *Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.)*

4. Understand subtraction as an unknown-addend problem. *For example, subtract 10 – 8 by finding the number that makes 10 when added to 8.*

Standards Domain Progression

K	1	2	3	4	5	6	7	8	HS
Counting & Cardinality									
Number and Operations in Base Ten						Ratios and Proportional Relationships			Number & Quantity
			Number and Operations – Fractions			The Number System			
Operations and Algebraic Thinking						Expressions and Equations			Algebra
								Functions	Functions
Geometry									Geometry
Measurement and Data						Statistics and Probability			Statistics & Probability

Domains

Conceptual Categories

K-8 Domains - Overview

Domains	K	1	2	3	4	5	6	7	8
Counting and Cardinality	■								
Operations and Algebraic Thinking	■	■	■	■	■	■			
Number and Operations in Base Ten	■	■	■	■	■	■			
Measurement and Data	■	■	■	■	■	■			
Geometry	■	■	■	■	■	■	■	■	■
Number and Operations - Fractions				■	■	■			
Ratios and Proportional Relationships							■	■	
The Number System							■	■	■
Expressions and Equations							■	■	■
Statistics and Probability							■	■	■
Functions									■

Format of K-8 Standards

Grade Level

Operations and Algebraic Thinking   1.OA

Domain

Represent and solve problems involving addition and subtraction.

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Standard

Understand and apply properties of operations and the relationship between addition and subtraction.

3. Apply properties of operations as strategies to add and subtract.[3] *Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.)*

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Cluster

Big Ideas in K-5

- Counting and Base Ten

- Concepts, skills, and problem solving related to addition and subtraction

- Concepts, skills, and problem solving related to multiplication and division of whole numbers and fractions

- Partitioning

- Reasoning and analyzing with shapes and their attributes

Kindergarten

Counting and Cardinality
- Know number names and the count sequence (3 standards).
- Count to tell the number of objects (2 standards).
- Compare numbers (2 standards).

Operations and Algebraic Thinking
- Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from (5).

Number and Operations in Base Ten
- Work with numbers 11–19 to gain foundations for place value (1).

Measurement and Data
- Describe and compare measurable attributes (2).
- Classify objects and count the number of objects in categories 1).

Geometry
- Identify and describe shapes (3).
- Analyze, compare, create, and compose shapes (3).

Domain

Cluster

READY

First Grade

Operations and Algebraic Thinking

•Represent and solve problems involving addition and subtraction(2).

•Understand and apply properties of operations and the relationship between addition and subtraction (2).

•Add and subtract within 20 (2).

•Work with addition and subtraction equations (2).

Number and Operations in Base Ten

•Extend the counting sequence (1).

•Understand place value (2).

•Use place value understanding and properties of operations to add and subtract (3).

Measurement and Data

•Measure lengths indirectly and by iterating length units (2).

• Tell and write time (1).

•Represent and interpret data (1).

Geometry

•Reason with shapes and their attributes (3).

Second Grade

Operations and Algebraic Thinking
- Represent and solve problems involving addition and subtraction (1).
- Add and subtract within 20 (1).
- Work with equal groups of objects to gain foundations for multiplication (2).

Number and Operations in Base Ten
- Understand place value (4).
- Use place value understanding and properties of operations to add and subtract (5).

Measurement and Data
- Measure and estimate lengths in standard units (4).
- Relate addition and subtraction to length (2).
- Work with time and money (2).
- Represent and interpret data (2).

Geometry
- Reason with shapes and their attributes (3).

Third Grade

Operations and Algebraic Thinking

•Represent and solve problems involving multiplication and division (4).

•Understand properties of multiplication and the relationship between multiplication and division (2).

•Multiply and divide within 100 (1).

•Solve problems involving the four operations, and identify and explain patterns in arithmetic (2).

Number and Operations in Base Ten

•Use place value understanding and properties of operations to perform multi-digit arithmetic (3).

Number and Operations—Fractions

•Develop understanding of fractions as numbers (3).

Measurement and Data

•Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects (2).

• Represent and interpret data (2).

•Geometric measurement: understand concepts of area and relate area to multiplication and to addition (3).

•Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures (1).

Geometry

•Reason with shapes and their attributes (2).

Fourth Grade

Operations and Algebraic Thinking

•Use the four operations with whole numbers to solve problems (3).

• Gain familiarity with factors and multiples (1).

•Generate and analyze patterns (1).

Number and Operations in Base Ten

•Generalize place value understanding for multi-digit whole numbers (3).

•Use place value understanding and properties of operations to perform multi-digit arithmetic (3).

Number and Operations—Fractions

•Extend understanding of fraction equivalence and ordering (2).

•Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers (1 with 4 parts, 1 with 3 parts).

•Understand decimal notation for fractions, and compare decimal fractions (3).

Measurement and Data

•Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit (3).

•Represent and interpret data (1).

•Geometric measurement: understand concepts of angle and measure angles (1 with 2 parts, 2 additional).

Geometry

•Draw and identify lines and angles, and classify shapes by properties of their lines and angles (3).

Fifth Grade

Operations and Algebraic Thinking
•Write and interpret numerical expressions (2).
•Analyze patterns and relationships (1).

Number and Operations in Base Ten
•Understand the place value system (3).
•Perform operations with multi-digit whole numbers and with decimals to hundredths (3).

Number and Operations—Fractions
•Use equivalent fractions as a strategy to add and subtract fractions (2).
•Apply and extend previous understandings of multiplication and division to multiply and divide fractions (4 – 2 with parts) .

Measurement and Data
•Convert like measurement units within a given measurement system.
•Represent and interpret data (1).
•Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition (3 – with parts).

Geometry
•Graph points on the coordinate plane to solve real-world and mathematical problems (2).
•Classify two-dimensional figures into categories based on their properties (2).

Big Ideas in Middle School

- Ratio and Proportional Relationships

- Expressions and Equations

- Linear Functions

- Pythagorean Theorem

- 2- and 3- Dimensional Geometric Problems involving Area, Surface Area, and Volume

Sixth Grade

Ratios and Proportional Relationships
Understand ratio concepts and use ratio reasoning to solve problems (3).

The Number System
Apply and extend previous understandings of multiplication and division to divide fractions by fractions (1).
Compute fluently with multi-digit numbers and find common factors and multiples (3).
Apply and extend previous understandings of numbers to the system of rational numbers (4).

Expressions and Equations
Apply and extend previous understandings of arithmetic to algebraic expressions.
Reason about and solve one-variable equations and inequalities (4).
Represent and analyze quantitative relationships between dependent and independent variables (1).
Geometry
Solve real-world and mathematical problems involving area, surface area, and volume (4).

Statistics and Probability
Develop understanding of statistical variability (3).
Summarize and describe distributions (2)

Seventh Grade

Ratios and Proportional Relationships
Analyze proportional relationships and use them to solve real-world and mathematical problems (3).

The Number System
Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers (3).

Expressions and Equations
Use properties of operations to generate equivalent expressions (2).
Solve real-life and mathematical problems using numerical and algebraic expressions and equations (2).

Geometry
Draw, construct and describe geometrical figures and describe the relationships between them (3).
Solve real-life and mathematical problems involving angle measure, area, surface area, and volume (3).

Statistics and Probability
Use random sampling to draw inferences about a population (2).
Draw informal comparative inferences about two populations (2).
Investigate chance processes and develop, use, and evaluate probability models (4).

Eighth Grade

The Number System
Know that there are numbers that are not rational, and approximate them by rational numbers (2).

Expressions and Equations
Work with radicals and integer exponents (4).
Understand the connections between proportional relationships, lines, and linear equations (2).
Analyze and solve linear equations and pairs of simultaneous linear equations (2).

Functions
Define, evaluate, and compare functions (3).
Use functions to model relationships between quantities (2).

Geometry
Understand congruence and similarity using physical models, transparencies, or geometry software (5).
Understand and apply the Pythagorean Theorem (3).
Solve real-world and mathematical problems involving volume of cylinders, cones and spheres (1).

Statistics and Probability
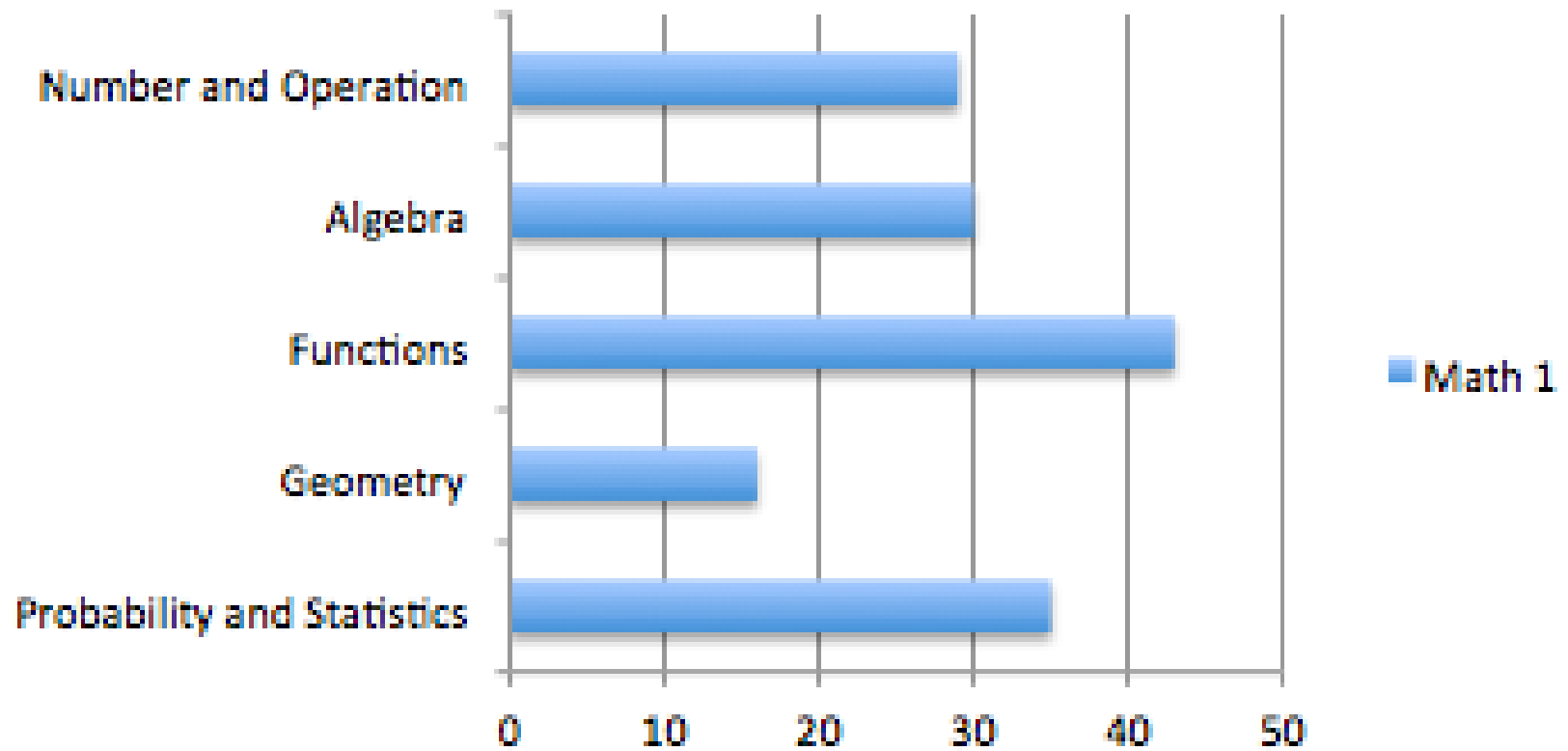Investigate patterns of association in bivariate data (4).

High School Major Work of the Course

Big Ideas in Math I, II, and III

- The Real and Complex Number Systems

- Expressions, Equations, and Inequalities

- Functions and Modeling

- Similarity and Congruence

- Trigonometry

- Categorical and Quantitative Data

- Probability

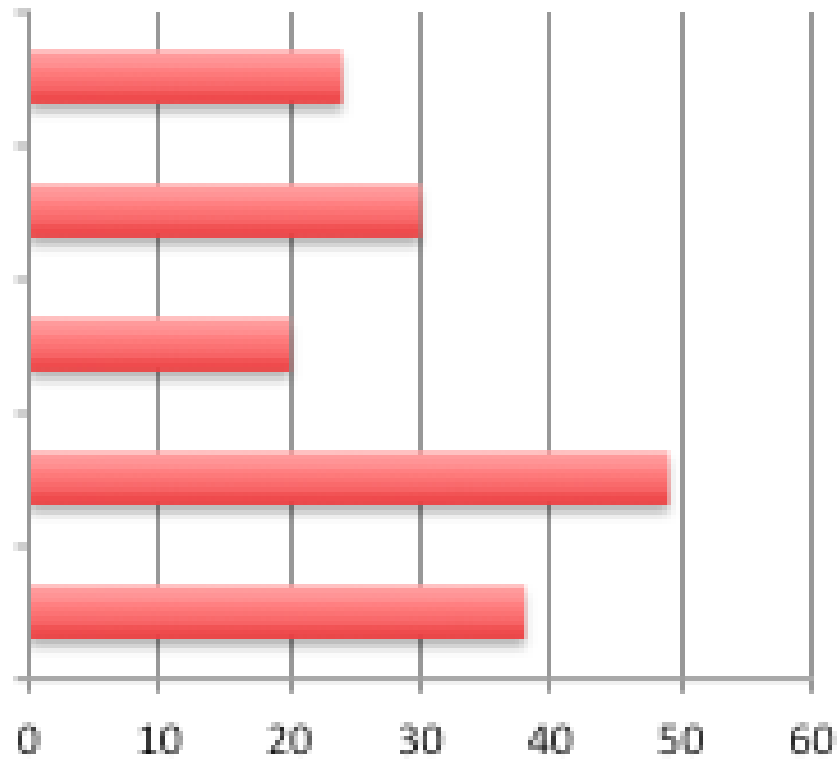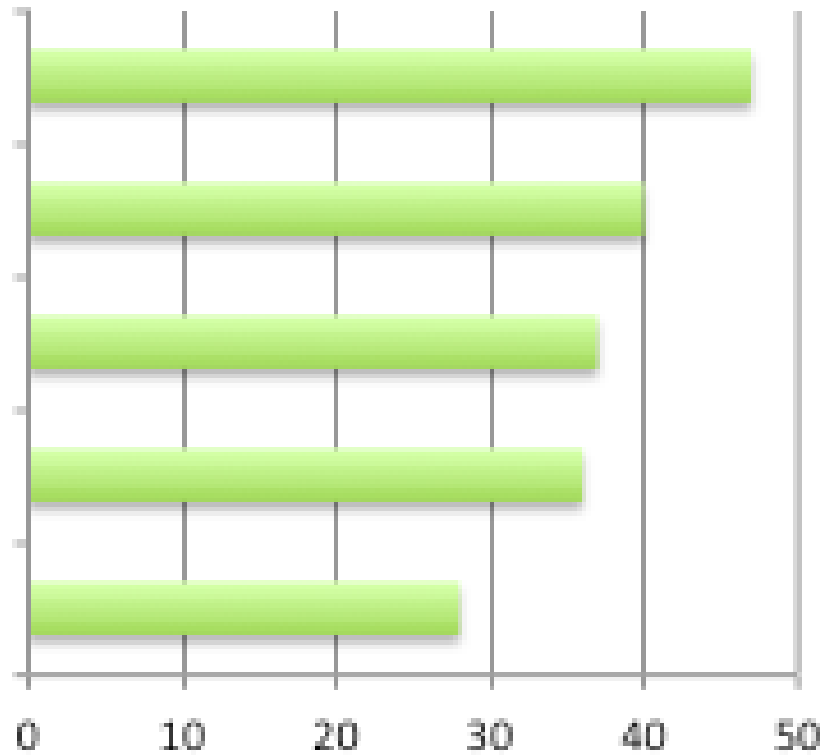North Carolina Integrated Option

Math 1   Math II   Math III
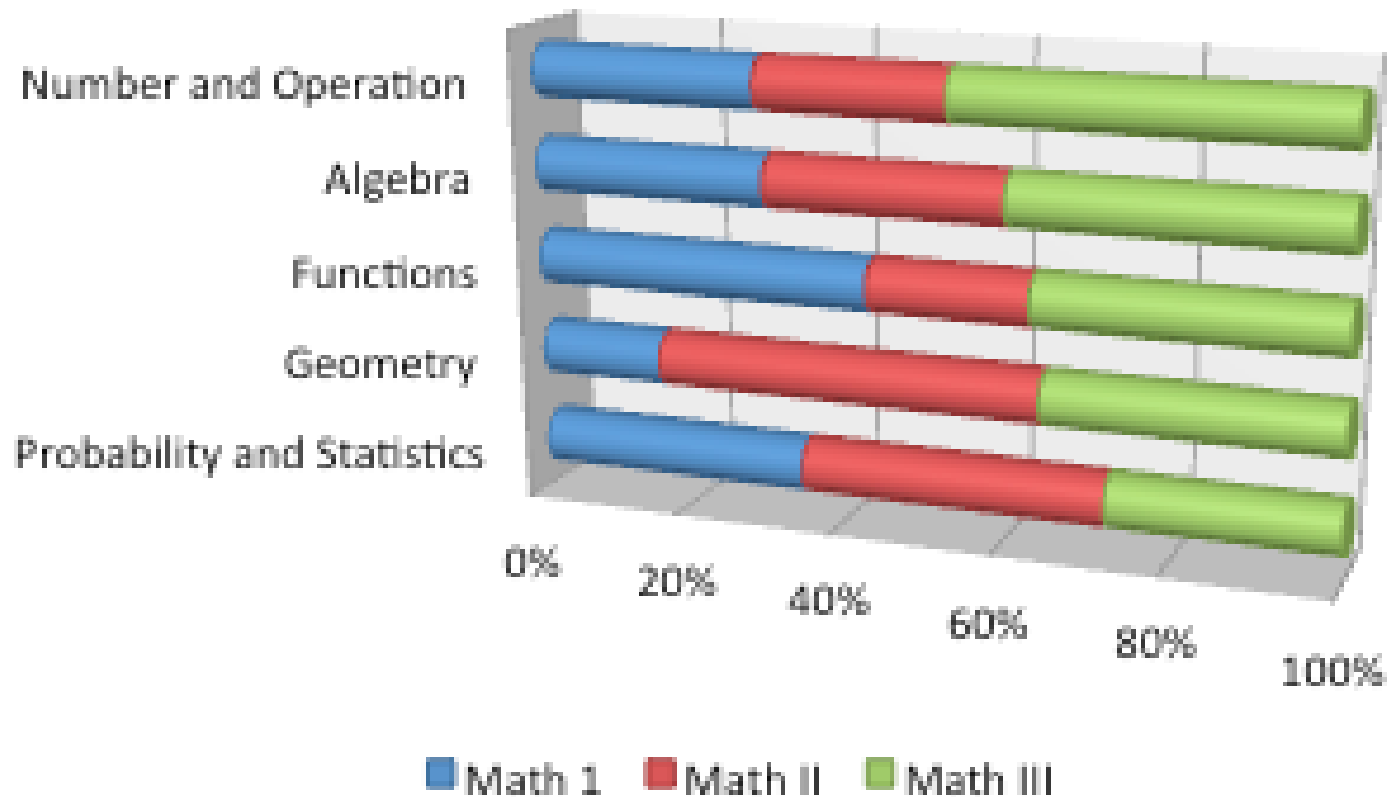
Recall the Format of K-8 Standards

Grade Level

Domain

Standard

Cluster

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Format of HS Standards

Arithmetic with Polynomials and Rational Expressions   **A-APR**

Conceptual Category

Perform arithmetic operations on polynomials

Domain

1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

Understand the relationship between zeros and factors of polynomials

Standard

2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.

3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

Cluster

Math I

The Real Number System
Extend the properties of exponents to rational exponents (2).

Quantities
Reason quantitatively and use units to solve problems (3).

Seeing Structure in Expressions
Interpret the structure of expressions (2).
Write expressions in equivalent forms to solve problems (1).
Arithmetic with Polynomials & Rational Expressions
Perform arithmetic operations on polynomials (1).
Creating Equations
Create equations that describe numbers or relationships (4).

Reasoning with Equations and Inequalities
Understand solving equations as a process of reasoning and explain the reasoning (1).
Solve equations and inequalities in one variable (1).
Solve systems of equations (2).
Represent and solve equations and inequalities graphically (3).

Interpreting Functions
Understand the concept of a function and use function notation (3).
Interpret functions that arise in applications in terms of the context (3).

Math I   Continued

Interpreting Functions
Analyze functions using different representations (3).

Building Functions
Build a function that models a relationship between two quantities (2).
Build new functions from existing functions (1).

Linear, Quadratic, and Exponential Models
Construct and compare linear & exponential models & solve problems (3).
Interpret expressions for functions in terms of the situation they model (1).

Congruence
Experiment with transformations in the plane (1).
Expressing Geometric Properties with Equations
Use coordinates to prove simple geometric theorems algebraically (4).
Geometric Measurement and Dimension
Explain volume formulas and use them to solve problems (2).

Interpreting Categorical and Quantitative Data
Summarize, represent, and interpret data on a single count or measurement variable (3).
Summarize, represent, and interpret data on two categorical and quantitative variables (2).
Interpret linear models (3)

Math II

The Real Number System
Extend the properties of exponents to rational exponents (1).
Quantities
Reason quantitatively and use units to solve problems (3).
Seeing the Structure in Expressions
Interpret the structure of expressions (2).

Write expressions in equivalent forms to solve problems (1).   **Arithmetic with**
Polynomials and Rational Expressions
Perform arithmetic operations on polynomials (1).
Understand the relationship between zeros and factors of polynomials (1).
Creating Equations
Create equations that describe numbers or relationships (4).
Reasoning with Equations and Inequalities
Understand solving equations as a process of reasoning and explain the reasoning (2).
Solve equations and inequalities in one variable (1).
Solve systems of equations (1).
Represent and solve equations and inequalities graphically (2).
Interpreting Functions
Understand the concept of a function and understand function notation (1).
Interpret functions that arise in applications in terms of the context (2).
Analyze functions using different representations (3).
Building Functions
Build a function that models a relationship between two quantities (1).
Build new functions from existing functions (1).

Congruence

Experiment with transformations in the plane (4).

Understand congruence in terms of rigid motions (3).

Prove geometric theorems (1).

Make geometric constructions (1).

Similarity, Right Triangles, and Trigonometry

Understand similarity in terms of similarity transformations (1).

Define trigonometric ratios and solve problems involving right triangles (3).

Apply trigonometry to general triangles (2).

Expressing Geometric Properties with Equations

Translate between the geometric description and the equation for a conic section (2).

Geometric Measurement and Dimension

Visualize relationships between two-dimensional and three-dimensional objects (1).

Modeling with Geometry

Apply geometric concepts in modeling situations (3).

Making Inferences and Justifying Conclusions

Understand and evaluate random processes underlying statistical experiments (1).

Make inferences and justify conclusions from sample surveys, experiments, and observational studies (1).

Conditional Probability and the Rules of Probability

Understand independence and conditional probability and use them to interpret data (5).

Use the rules of probability to compute probabilities of compound events in a uniform probability model (4).

Math III

The Real Number System
Use properties of rational and irrational numbers (1).
Quantities
Reason quantitatively and use units to solve problems (3).
The Complex Number System
Perform arithmetic operations with complex numbers (2).
Use complex numbers in polynomial identities and equations (2).
Seeing the Structure in Expressions
Interpret the structure of expressions (2).
Write expressions in equivalent forms to solve problems (2).
Arithmetic with Polynomials and Rational Expressions
Perform arithmetic operations on polynomials (1).
Understand the relationship between zeros and factors of polynomials (2).
Use polynomial identities to solve problems (1).
Rewrite rational expressions (2).
Creating Equations
Create equations that describe numbers or relationships (4).
Reasoning with Equations and Inequalities
Understand solving equations as a process of reasoning and explain the reasoning (2).
Solve equations and inequalities in one variable (1).
Represent and solve equations and inequalities graphically (2).
Interpreting Functions
Understand the concept of a function and understand function notation (1).
Interpret functions that arise in applications in terms of the context (2).
Analyze functions using different representations (3).

Building Functions
Build a function that models a relationship between two quantities
Build new functions from existing functions
Linear and Exponential Models
Construct and compare linear, quadratic, and exponential models and solve problems
Trigonometric Functions
Extend the domain of trigonometric functions using the unit circle.
Model periodic phenomena with trigonometric functions.
Prove and apply trigonometric identities.
Congruence
Experiment with transformations in the plane (1).
Prove geometric theorems (1).
Understand congruence in terms of rigid motions (2).
Make geometric constructions (1).
Similarity, Right Triangles, and Trigonometry
Understand similarity in terms of similarity transformations (2).
Prove theorems involving similarity (2).
Circles
Understand and apply theorems about circles (3).
Find arc lengths and areas of sectors of circles (1).
Expressing Geometric Properties with Equations
Translate between the geometric description and the equation for a conic section (2).
Modeling with Geometry
Apply geometric concepts in modeling situations (1).

Math III Continued

Interpreting Categorical and Quantitative Data
Summarize, represent, and interpret data on a single count or measurement variable (1).
Making Inferences and Justifying Conclusions
Understand and evaluate random processes underlying statistical experiments (1).
Make inferences and justify conclusions from sample surveys, experiments, and observational studies (4).
Using Probability to Make Decisions
Use probability to evaluate outcomes of decisions (2).

Make sense of problems and persevere in solving them

Attend to precision

1.
6.

2. Reason abstractly and quantitatively

3. Construct viable arguments and critique the reasoning of others

4. Model with mathematics

5. Use appropriate tools strategically

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.

Reasoning and explaining

Modeling and using tools

Seeing structure and generalizing

Overarching habits of mind of a productive Mathematical Thinker